A SIMPLE METHOD FOR MAKING COPIES OF FIELD SHEETS IN THE FIELD

Developed and used on Lower St. Lawrence River Survey

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By

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LIST OF CONTENTS

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INTRODUCTION

Once again it became apparent this year that when selecting shoals to be examined from a field sheet a lot of time is being spent inking them in red on an overlay and subsequently surrounding every one of them with a few 'black' soundings. This is supposed to give the hydrographer, whose task it is to find and examine these shoals, a good indication of what can be expected. It takes considerable time to prepare such overlays and it still does not give the hydrographer the overall picture. He does not know whether he works near a channel, generally shallow area or what to really expect. He therefore will have difficulties deciding whether interlining is sufficient or if a "star" is required or a pattern of closely spaced lines perpendicular to each other.

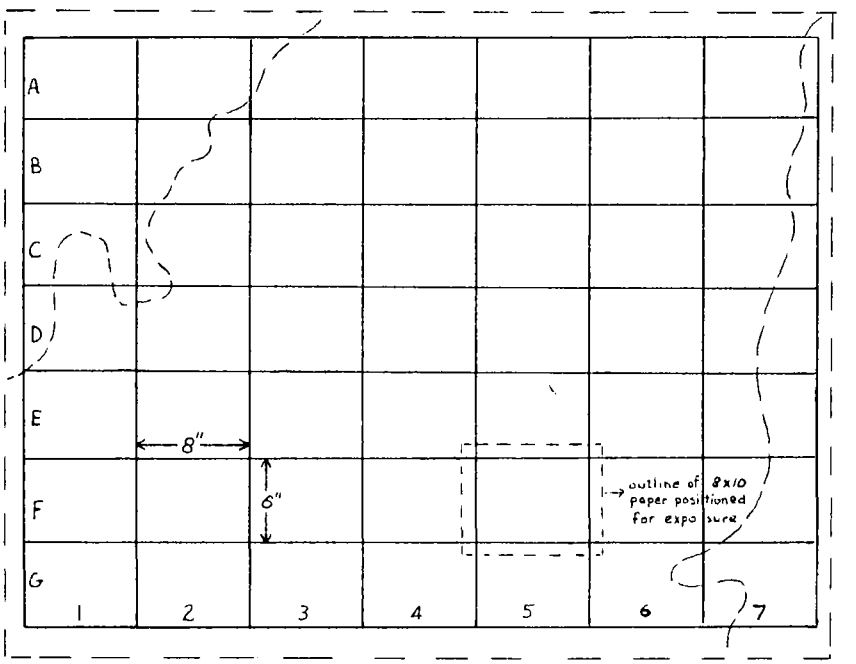
With the large increase in the use of electronic positioning systems in the last few years the hydrographer in charge of a launch becomes less and less aware of what the sounded area is really like. The field sheet portrays the latest available information from previous surveys and the survey being conducted. It would therefore be of great help to the hydrographers running the launches to know whether the shoal sounding to be investigated is either a ridge, a pinnacle, sand dune or other type of shoal. The field sheet gives also a good idea on how far to go off the shoal (once it has been located) with the sounding lines and in which way to tackle the shoal. However, we all know it is impossible to take the field sheet into a boat for a variety of reasons.

We developed a simple method to provide photographs of portions of a field sheet that hydrographers could take out in a launch when doing shoal examinations. The process includes the indexing and processing of light sensitive papers, commonly

known as photographic paper. This process requires such equipment as a makeshift darkroom, photographic chemicals, a few miscellaneous chemical storage bottles, graduated cylinders and a supply of photographic paper. It requires an initial investment of about $25.00. One should count on a seasonal cost of $10.00 to $15.00 for chemicals and other items that are used up on top of the initial investment.

INDEXING

The first step is to prepare a grid overlay (see sketch). This will be an aid in keeping track of the exposures, getting a sufficient overlap and later, orientating the prints in relation to each other and to the survey area. A grid produced with the same co-ordinates on the largest scale chart of the area will also be found useful.



PROCESSING PHOTOGRAPHIC PAPERS

THE EXPOSURE

We will make our prints using the following theory. A negative is placed between the light source and a piece of photographic paper allowing only sections of the paper to become illuminated. The negative can be carried either in an enlarger and be projected down upon the paper or be placed in contact with the paper. The former making 2x, or 3x or any size enlargements and the latter a simple 1x "contact print". We will only concern ourselves with the latter method.

The "negative" in our case will be the field sheet. The paper will be placed in contact with and underneath it. Any transparent glass plate of approximately 10" x 14" x ¼" placed over the two will make the contact uniform. The 8" x 10" paper we have been using was found to be a useful size covering a large enough area. This size is convenient to carry around. The photographs or "contact prints" then will be a series of 8" x 10" sections of the field sheet, each with sufficient overlap.

A darkroom is required for the exposure and development so it must be of sufficient size to hold a table large enough for the field sheet and another table to hold the four trays of chemicals. The amount of darkness one can obtain will have a direct bearing on the quality of the contact prints. Obviously total darkness will be very difficult, if not impossible, to achieve and may not be necessary for the type of work we will be doing. Obviously all main sources of light entry into the room must be blocked. An attempt should be made to reduce the entry of light around door jambs and window sills and joints. A "safelight" is used in the darkroom. This provides all the necessary lighting required while working in the darkroom. Photographic papers are not affected by this light as long as

they are not held closer than 4 feet. The light to be used for exposure of the photographic papers can be, in most cases, the existing lighting in that room. Preferably the light should be positioned over the print area to provide uniform illumination and there should be no shadows cast over it as these will affect the print. Exposure times will vary with the type of illumination used and it is best to experiment. For example, we used a fluorescent light fixture which was mounted onto the ceiling about 10 feet over the table and to the side of the latter. The exposure time was about 2 seconds with the lights fully on using an average contrast paper (Kodabromide, F-3, glossy, single weight). The exposure time will vary widely depending on these two factors: i.e. the type of illumination and the type of paper used, so experiment to find the best time for your conditions.

THE DEVELOPMENT

The chemicals required to process the prints are as follows: developer, stop bath and fixer. All chemicals are mixed with water. Full directions can be found on the cans, bottles and boxes in which they come. The quality of the print will depend on how closely you follow those instructions. The working temperature should be around 68°F for all solutions. However, do not worry too much if it is off by a few degrees. The paper should stay at least 90 seconds in the "developer tray" with frequent agitation. The agitation is important for it replaces the partly exhausted chemical in contact with the paper surface with a fresher part of the solution. It is easiest accomplished by gently lifting one side of the tray and causing a wave flow across the surface. The "stop bath" in the second tray halts the development process. The paper should remain 5-10 seconds in this solution with agitation. The "fixer" is in the third tray and it 'hardens' the print so that it is no longer light sensitive. Once in the fixer for about 1 minute the print is no longer light sensitive and the main light can be

switched on. The permanency of the print depends on the length of time the paper has been in the fixer and for our work we recommend 5 minutes. Finally the print must be washed thoroughly in fresh water of about 68°F and this can be done in a sink, bucket or anything large enough to hold several photos. Let the water run constantly from the tap, while simultaneously letting the water run out at the same rate, in such a way that the water in the sink, bucket or tray is gradually replaced completely by fresh water once every 5 minutes. If this is not possible, agitate the prints manually and regularly for 5 minutes. Thence let the water run out or pour it out and replace with fresh water once every 5 minutes. The prints actually "soak" clean so it is the length of time in the water which is important. Thirty minutes is recommended for the washing time of simple weight papers. There is an optional washing aid available, which shortens the washing time. The prints are placed in this solution (called "Hypo Clearing Agent) immediately after they come out of the fixer and remain in there 1-2 minutes (single weight papers). Subsequently the above described washing procedure is followed, however now only for a total of 10 minutes instead of 30 minutes.

The prints can be hung out anywhere to dry. While drying the paper will curl up and this is a normal occurrance especially if they dry too quickly. Once dry, the prints can be placed face to face together in a pile under some books or weights to flatten them again.

RECOMMENDATIONS

The prints are now ready for use and can be written upon with a felt marker pen. For our shoals we simply circled the suspect sounding in red, gave it an identifying letter and prepared a list with the coordinates of the positioning system to be used opposite the "depth looking for" and above letter. With the photograph with him in the boat, we think the hydrographer can now make a better judgement on how to examine the area he is interested in.

If required, one could add some distance rings or hyperbolas to the photograph by overlaying the lattice on the field sheet. Exposure time will have to be increased and the lattice will come out somewhat fuzzy because it cannot be in direct contact with the photographic paper and will therefore be out of focus. The advantages of this added lattice are obvious. If however the shoal examinations are performed using the same electronic positioning system as that used for the main sounding lines, this will not be necessary, because usually these lines are run following the patterns of these E.P.S.'s and then the soundings on the Field Sheet also form the lattice, its values identified by the coordinates given for each shoal on the earlier mentioned list.

The chemicals and paper which we have been using were chosen because of our familiarity with them and in the case of the paper, because of a ready supply. They were not designed to do this type of work although the results were acceptable. A little further experimentation with other papers and developers might result in an easier and better quality print. For instance a paper is available designed for contact printing. It is less sensitive than enlarging papers and thus makes for longer exposure times. This enables better control over the correctness of the exposure. For example in our case if we exposed the paper by say $\frac{1}{4}$ second too long or too short during our 2 second exposure then the photograph would turn out too dark or too light so no detail was visible. We have then an un-allowable error of $12\frac{1}{2}\%$. Now if a paper designed for contact printing were used the exposure time might have to be, say, 25 seconds. This time however, that $\frac{1}{4}$ second timing error represents only 1% of the total time required. In other words, the longer the necessary exposure time the less influence a timing error will have.

In some areas where photo-sounding is used and/or sextant sounding it may be advantageous to use larger size photos, in order that shoreline on both sides of the lake or river may be shown, or to display enough shoreline with control to enable sextant fixes to be plotted. In that case 11"X14" size photos with a large overlap might be handy. If you are worried about shrinking or stretching affecting the accuracy, we have good news. All our photos were done in July and by December they had shrunk about 0.2 mm. It is conceivable that they would shrink more in drier and especially warmer areas when used in open boats. However, a daily spot-check on photos so used would expose any appreciable shrinkage. Shrinkage could be reduced by using so-called "double-weight" paper, however, this would about double the cost of the paper. One hydrographer suggested to us that a light table could be used as a light source, it usually being on a fair sized table. This may be feasible, by still putting the index on the light table and placing the Field Sheet on top of it, however both should be upside down. One now places in succession the photographic papers upside down and expose them. However light tables have a fairly bright light and their close proximity to the papers when exposing will present a problem. The light intensity may be reduced by using blank chartpaper or similar devices. When shorelining one could use the photographs as well. All information could easily be plotted in the field onto them with the advantage that it can be shown at survey scale throughout the area covered by the photograph. This is not possible with aerial photos, because they are seldom exactly to scale and then only near the centre.

It may be inconvenient to get your darkroom set up, depending on the locality of your field headquarters, however, we do not foresee that you will have to darken your room more than twice per season. However if you think you may use it regularly, you could leave the room "permanently blinded" so that you would only have to close the door and flick the light-switch to turn it into a darkroom.

Storage bottles for chemical solutions can be bought, however it is far cheaper to use empty sherry, wine or cough-syrup bottles made of dark-coloured glass, as long as they have screw-on caps and are washed thoroughly.

Finally, the applications of the described process are only limited by your imagination. We would gladly advise on any suggestions you may have, however, we are sure that your local photographic shop can handle them.

CAUTION: *The instructions in this article apply mainly to the process as described and are not necessarily correct for the processing of papers in ordinary photography.*

APPENDIX 1

TABLE OF EQUIPMENT REQUIRED

	NAME	BRANDNAME	COST	REMARK
3	Trays (8x10)	PATERSON	$ 6.00	to hold the solutions
1	Ladle	N/A	$ 0.75	to mix chemicals with water
1	Thermometer	N/A	$ 3.00	photographic type only
1	Graduated Cylinder	PATERSON	$ 4.00	holds 42 oz.
1	Graduated Cylinder	PATERSON	$ 2.75	holds 11 oz.
3	Tweezers	N/A	$ 2.25	
1	Darkroom lamp	KODAK	$ 4.50	Wratten series 0, yellow cup.
	Total Initial Investment		$23.25	

SEASONAL PURCHASES

Developer	Kodak "Dektol"	$0.90	makes 1 U.S. quart
Stopbath	Kodak "Indicator Stop Bath"	$1.75	makes 8 U.S. gallons
Fixer	Kodak "Fixer"	$0.70	makes ½ U.S. gallon
Paper	Kodabromide, F-3, glossy, single weight	$9.00	box of 100 sheets 8 x 10
Washing Aid	Kodak "Hypo Clearing Agent"	$1.40	makes 8 gallons

NOTE: all developer has to be mixed at once and kept in a well stoppered bottle

stopbath can be mixed in quantities as required for a session

Fixer can be made in smaller quantities than indicated on the label. Use 5¼ oz. (imp.) liquid measure in 950 cm^3 of water, and reseal package each time.

APPENDIX 2

TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Developed sheet completely black	Far too much light	cut exposure to $\frac{1}{4}$ of previous and try again
Too light, no detail	Not enough light	double exposure and try again
Overall grayness with little detail	1) outside light entering darkroom and striking unexposed paper	1) check for light leaks and block
	2) paper too close to darkroom lamp (safelight)	2) move at least 4ft. from lamp
Soundings appear fuzzy as if not in focus	paper not in contact with field sheet	place glass sheet over the print area to assure firm contact
Good images in only part of print rest in greyness with no detail	Shadow falling across the print during exposure blocking some or all of light in that area	eliminate shadow
Developer seems to get weaker (i.e. developing is taking longer than normal)	1. developer too old	1. replace with fresh solution
	2. developer contaminated with "Fixer and/or Stop Bath"	2. do not dip anything into developer after having been in other solutions. Wash ladles before using them for mixing a different chemical.

APPENDIX 3

SOLUTION	KEEPING PROPERTIES WITHOUT USE			USEFUL CAPACITY
	Stock Solution		Working Solution	8"x10" sheets
	Stoppered Bottle		in Tray	per gallon
	Full	Half Full		
Dektol	6 mo.	2 mo.	1 session	120 (1:2)*
Indicator Stop Bath	Indef.	Indef.	3 days	80 **
Fixer	2 mo.	2 mo.	7 days***	100
Hypo Clearing Agent	3 mo.	3 mo.	1 session	80

* The Solution obtained by following the directions on the can is the "stock solution". To obtain a "working solution" mix 1 part stock solution with 2 parts water. It is for the working solution that the useful capacity is shown.

** Discard working solution when the colour changes to purplish blue. This is the only stop bath that shows its exhaustion by changing its colour. Although there are cheaper self-made shop baths available it is recommended by the authors for the "occasional hydrographer" for its obvious advantage.

*** If the working solution is poured into a separate bottle after use it could be stored for a month.

NB Keeping properties figures are average and valid only if kept between 65^{o}- 75^{o}F.

APPENDIX 4

STEP BY STEP INSTRUCTIONS

1. Mark trays so you don't mix them up.

2. Mix developer, watch temperature, pour in tray, 33 ounces per tray will suffice.

3. Wash out cylinders with clean water (no soap).

4. Mix stop bath, watch temperature, pour in tray.

5. Wash out cylinders with clean water.

6. Mix fixer, etc.

7. Wash ladle, cylinders, etc. and put aside.

8. Place tweezers (one at each tray).

9. Place index grid on table and tape down (must be flat).

10. Place field sheet on top of index.

11. Turn off main light, darkroom lamp on.

12. Remove required amount of sheets of paper from package.

13. Place into box or other device that is lightproof.

14. Put remainder of paper away in safe place.

15. Place 1 sheet of 8x10 underneath field sheet and line up with first rectangle of index with light sensitive side up.

(the back of the paper is dull, the light sensitive side is therefore easily recognized.).

16. Place glass plate on top of field sheet (to ensure flatness and good contact you can apply pressure with hands on the glass, making sure your hands or head do not block the light for exposure).

17. Turn on main light or whatever source you use for the exposure, and switch off when exposed for desired time.

18. Remove paper from underneath field sheet and put into developer tray (face up or down).

19. Make sure developer covers entire sheet.

20. Agitate paper.

21. After 90 seconds remove from tray, drain above tray.

22. Put in stop bath 5-10 seconds, remove and drain above tray.

23. Put in fixer for about 5 minutes, remove and drain above tray.

24. Make sure tweezers stay with their respective trays so they do not contaminate the other solutions and shorten their lives.

25. Place paper in washing container.

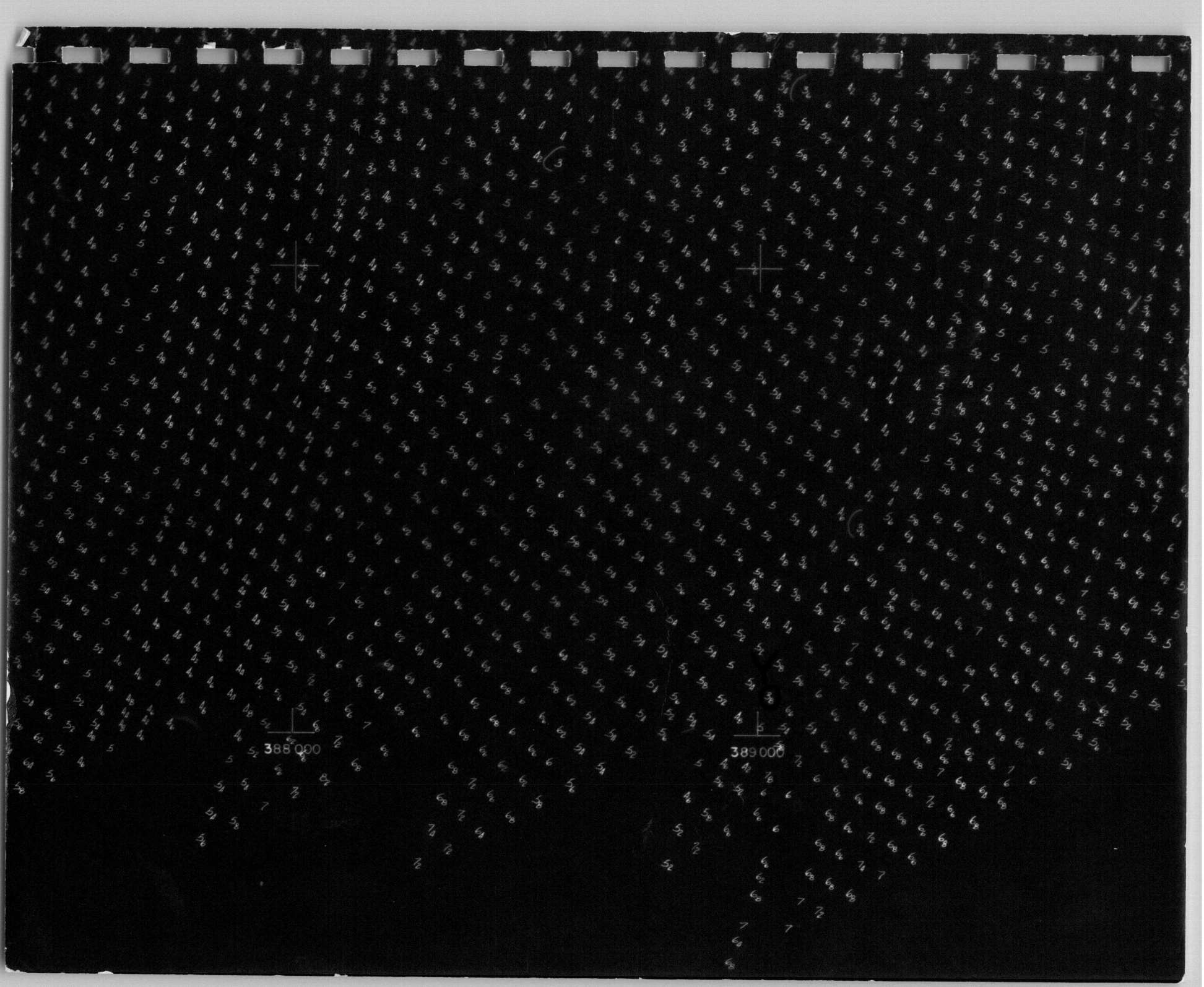
26. Wash for 30 minutes.

27. Hang or place on table to dry.

N.B. Always add chemical to water when mixing.

Glass should not have sharp edges or it may damage the field sheet.
If picture did not turn out there is no sense putting it in the stop bath, etc. Throw it out.
It is not necessary to wait until the first picture is completed once the correct exposure time has been found.
It will work best by exposing all sheets in succession and placing them in a separate box, so they are not exposed to light a second time. Once all sheets have been done you can start processing them.

Wash hands thoroughly upon completion.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